October 2016 **NJ-2016-004**

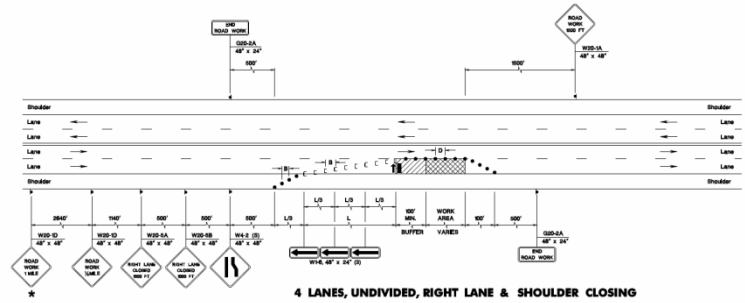
New Jersey Department of Transportation
Bureau of Research

Technical Brief

Optimizing Work Zone Lighting

This project investigated the visual needs of workers and drivers in work zones, and the technical performance of new technologies and approaches for improving visual effectiveness while reducing glare and visual chaos. This Technical Brief summarizes the work zone lighting and traffic control guidelines for several different scenarios, based on the findings from this study.

Long Term, Stationary Projects

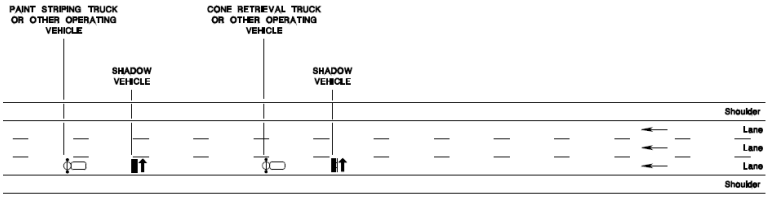


4 LANES, UNDIVIDED, RIGHT LANE & SHOULDER CLOSING

Long term, stationary projects include road construction and reconstruction activities over a period of several weeks or longer.

Illumination Systems	
Portable Trailer-Mounted Light Towers	• 110 foot spacing provides 5 footcandles of illumination within two traffic lanes
Balloon Lights	• Distance (D, feet) at which illuminance (E, footcandles) is produced by a balloon light with a light output (L, lumens) and a mounting height (H, feet) can be estimated by: $D = \sqrt{\frac{18L}{250E} - \frac{H^2}{2}}$
Semi-Permanent High Mast Lighting	• Used for projects of several months duration • Staggered arrangement spaced 320 feet apart per side provides 10 footcandles along six traffic lanes
Signage and Delineation	
Sign Sheeting Materials	• ASTM Type III sufficient in most conditions; Type IV or XI for very bright, complex visual environments • Increased font size (>8 inches) for legibility at longer distances
Barricades and Barrels	• ASTM Type I sufficient in most conditions; Type IV or XI for very bright, complex urban environments
Warning Lights	
All Flashing Lights	• "High-low" flashing rather than "on-off" should be used
Vehicle-Mounted Beacons and Lights	• Peak intensity at least 600 candelas (effective intensity 430 candelas) for daytime visibility • Peak intensity of 200 candelas (effective intensity of 140 candelas) for nighttime visibility • Green lights equipped with dimming for glare control
Barricade Lights	• Type A for rural environments; Type B for urban locations • Sequential flashing for lane closure tapers

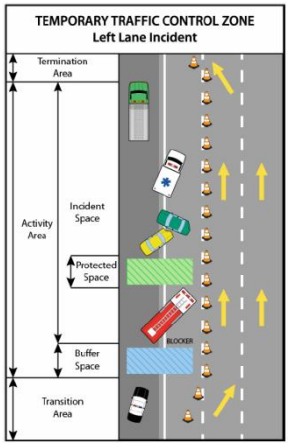
Slow-Moving Operations



Slow-moving operations include painting, road surface patching, and snow plowing, where service vehicles operate at reduced speeds.

Illumination Systems	
Vehicle-Mounted Light Towers	• Not recommended; glare can be problematic and light levels excessive
Vehicle-Mounted Balloon Lights	• For movement, provide 1 footcandle 15 feet ahead of slow moving equipment and 50 feet ahead of fast-moving equipment • Visual tasks such as inspection of pavement for defects may require higher illuminances of at least 5 footcandles • Use equation on reverse to estimate illuminance
Signage and Delineation	
Barrel Wrap (if used)	• ASTM Type I sufficient except in most brightly illuminated, complex urban environments
Warning Lights	
Vehicle-Mounted Beacons and Lights	• Peak intensity at least 600 candelas (effective intensity 430 candelas) for daytime visibility • Peak intensity of 200 candelas (effective intensity of 140 candelas) for nighttime visibility • “High-low” rather than “on-off” flashing should be used • Green lights equipped with dimming for glare control

Emergency Incidents



Emergency roadway situations include motor vehicle accidents, fallen power lines or trees where time for planning is unavailable.

Illumination Systems	
Vehicle Headlights	• Direct away from oncoming traffic
Signage and Delineation	
Traffic Cones	• Use devices with ASTM Type IV or XI sheeting
Warning Lights	
Vehicle-Mounted Beacons	• Consider dimming and switching off flashing lights if multiple vehicles are present • Use “high-low” rather than “on-off” flashing
Barricade Lights (if available)	• Use Type B barricade lights • Use sequential flashing to indicate lane closure
Flares	• Use flares or other warning devices intially

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A final report is available online at: http://www.state.nj.us/transportation/refdata/research/.
If you would like a copy of the full report, send an e-mail to: Research.Bureau@dot.state.nj.us.